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ADAPTATION OF FLATS IN CONCRETE SLAB BUILDINGS FOR PEOPLE WITH DISABILITIES. ISSUES, COSTS, REIMBURSEMENT OPTIONS, COMPARISONS

Małgorzata BARTNICKA *

*PhD Eng. Arch.; Faculty of Architecture, Bialystok University of Technology, Oskara Sosnowskiego Street 11, 15–893 Bialystok, Poland
E-mail address: *m.bartnicka@gmail.com*

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Abstract
Poland is bound by law to ensure equal opportunities and non-discrimination. Architectural barriers in space can be considered a form of discrimination against disabled people. The purpose of the article is to argue that both the old pre-cast concrete slab apartments as well as the newer buildings (built after 1995) require adaptation in order to cater for the needs of the disabled. The article outlines the developments in design for people with disabilities, starting from the programme of "abolishing architectural barriers", through "universal design" to "design for everyone". The paper presents some qualitative studies, in which functional quality of flats was used as the main criterion for evaluation. Using comparative analysis, a list of redevelopment possibilities and approximate costs of such adaptations in flats was compiled. Apartments M3 (38–48m^2) were selected for the purpose of the study. Existing projects were assessed and compared and appropriate improvements were suggested. Subsequently, approximate costs of the proposed adaptation measures were calculated, as well as the possibilities of reimbursement under the PFRON co-financing (including buildings constructed before January 1, 1995). Finally, the paper puts forward a few postulates regarding further development of the idea of design for everyone, a proposal to create an Accessibility Charter and the system of extra investments in the redevelopment of entrance areas of blocks of flats.

Keywords: **Adaptations in flats; Bathroom; Disabled people; Multi-family housing; Flat accessibility charter.**

1. INTRODUCTION

On July 26, 1990, the United States issued the first document stating that no person could be discriminated against on account of their disability. This was the *Americans with Disability Act* (ADA) [1] and it has become an example for so many countries to follow. The subject was also raised during the *1st European Conference of People with Disability* (EURABLE) organized by the Dutch Council for the Disabled (2-4 August 1993) in Maastricht [2] three years later. The first official records of the law appeared in the Treaty of Amsterdam, according to which all European Union countries committed to take action aimed at counteracting all discrimination, including those with disabilities [3] (Article 10). Sejm, the lower chamber of Parliament of Poland, adopted the *Charter of Persons with Disabilities*, guaranteeing the right to full participation in society, including *living in an environment that is free from functional barriers* [4] in Poland in 1997. Finally, all the rights of people with disabilities have been guaranteed and confirmed by the United Nations *Convention on the Rights of Persons with Disabilities* [5], ratified by Poland in 2012. The Convention states the principle of equal opportunities and non-discrimination and the general availability of services, products and space to all including those with disabilities.

It should be emphasized that the mere presence of architectural barriers, whether in urban spaces or res-

idential dwellings, is a form of discrimination against people with disabilities. Design advocated as "universal" and following the principle of facilitating products and services in such a way that these are accessible to all ([5], art.2) does not seem to be implemented much, at least not to the full extent it could be. While public spaces are becoming more open and accessible to people with disabilities, residential spaces do not always meet the required criteria. The provision of Article 5. 1. point 4 of The Building Law Act states that *the building object (...) should be designed and built in accordance with the principles of technical knowledge, ensuring: (...) the necessary conditions for the use of (...) multi-dwelling residential housing by persons with disabilities, operating in wheelchairs* [6]. This provision guarantees the statutory right of the disabled to use multi-family housing dwellings. However, in reality it often fails to be implemented. In accordance with the provisions of the Building Regulations [7] newly constructed middle and high-rise multi-family buildings must be equipped with passenger lifts, which provide access to each floor for disabled people ([7] §54 section 1 and section 2). In the absence of a lift, access to flats on the ground floor ([7] § 55 section 1) is required. One may get the impression that the problem has been resolved, but after a more thorough analysis, it should be noted that we are dealing with a very "literal" and surface treatment of this issue. The building accessibility zone is usually limited only to those parts of the building that are specified by law. This does not mean that the interiors of flats and apartments themselves are equally accessible.

1.1. Purpose and research methods

In Poland, current legislation regarding accessibility of buildings in terms of access for people with disabilities refers to and concerns buildings built after 1994. The laws do not take into account residential buildings from the previous period, although such buildings constitute a significant percentage of dwellings (over 80% according to the 2011 census). Due to the existing housing structure in Poland, people with disabilities tend to live in premises from the earlier periods (pre- 1994). The vast majority of these are buildings constructed in a pre-fab concrete slabtechnology. The aim of the paper is to demonstrate that virtually all apartments, both those built before 1995 as well as the newer buildings built after that date, require adaptation measures in terms of accessibility. The major differences remain the scope of necessary changes, their cost and the possibility of reimbursements for renovations and adaptations. For the study, a short qualitative research in which the main criterion was the functional quality of a flat for a person with disabilities was carried out. As a determinant factor of ensuring the comfort of movement in the interior, a manoeuvring area in the form of a square of 150 × 150 cm was assumed. The research was based on relevant literature review, thorough analysis of design documentation in terms of the possibility of redevelopment and adaptation and conclusions drawn from the design of a selection of concrete slab buildings.

A rough approximation of estimated costs of adaptations needed for a person with a disability in an apartment constructed in concrete slab system is provided below. This is further compared with approximate costs of similar adjustments in contemporary flats.

At the same time these costs will be linked to the possibility of reimbursemesnts, which can be claimed under the State Fund for the Rehabilitation of the Disabled (PFRON) programme.

This paper presents some of the typical projects of the 70s and 80s, which were developed based on various older technologies and systems such as: OWT-67, WUF-T, WWP, Szczecin System, W-70, SBM-75 and OWT-75. These "sample" projects are then "tailored" to the needs of the disabled. An indicative estimate of the repair works and a comparison table are presented. This paper illustrates the amount of financial contributions needed and the flexibility of some of these technologies to changes [8] needed in order to facilitate better accessibility. The conclusions presented compare the cost effectiveness of adaptability of old flats versus the adaptability of modern apartments, which, in hindsight, should have already been designed and built with the disabled access and functionality in mind.

1.2. Knowledge

The idea of design that takes people with disabilities in consideration is not a new one in Poland. Towards the end of the 1960s a few papers related to the needs of the elderly were published by Wanda Czeczerda and Danuta Kozińska [9, 10]. In 1978 in Miedzeszyn, the Scientific Council of the Central Association of Housing Cooperatives organized a scientific seminar on the integration of people with disabilities in the housing environment. The seminar discussed issues of architectural and urban barriers. Even then it was noted that there were many physical barriers in the interiors themselves, such as *unnecessary thresholds*

between rooms, narrow doorways, window locks too high and difficult to handle, poorly resolved workplaces in the kitchen, areas with inaccessible lockers, lack of bathtubs, inaccurate storage [11]. During this seminar, Halina Skibniewska, an advocate of the removal of architectural and urban planning barriers in home environment, posed an important question: *who do we build cities for? Is it only for the healthy majority?* More valid remarks were made by the co-founder of the Polish rehabilitation school, a physician, Marian Allan Weiss, who spoke *of the role of the program of removing architectural barriers in the rehabilitation of people with impaired efficiency*. Additionally, Jan Szczepański, a sociologist, assessed and underlined *the social situation of people with disabilities*. Participants of the seminar also familiarized themselves with housing solutions for the disabled in the Sadyba housing estate in Warsaw, which was built in 1975–76 on the initiative of Skibniewska and Weiss. The main agenda of the meeting was *to instil the belief* that the way forward is not through creating *a parallel world* and segregation, but through full integration both in the housing environment and in the future in an open city [11]. In the following years interest in design for the disabled has been on the increase. The Institute of Industrial Design (IWP) published a selection of relevant publications on kitchen design [12], residential and sanitary interiors [13] and anthropometric data for design [14]. Subsequently, more papers on the topic were published by the Central Research and Design Centre for General Construction [15, 16]. Further relevant publications were also printed in cooperation with Halina Skibniewska [17]. More recent papers on this topic were published by the Friends of Integration Association and are called *the Library for Persons with Disabilities* [18, 19]. All of the listed above describe the principles of designing spaces dedicated for people with disabilities based on the legislation, ergonomics and mobility constraints. However, it was not until the 1990s that Universal Design was introduced, a trend that had previously developed in many countries, especially in the United States since the 1950s. In the first phase, it was the so-called *Barrier-Free design*, which was described in the new law: *The Architectural Barriers Act of 1968* [20]. Still, the program had a tendency to segregate (rather than to include) through the creation of designated places for the disabled. The next phase was in the 1970s when the design trend evolved to develop accessible design products, services and environments. In 1989 at the Design College at North Carolina State University in Raleigh Ronald (Ron), Mace opened the Centre for Universal Design (CUD), which was federally-funded.

This national research centre develops and promotes the philosophy of universal design in residential, public and urban environments as well as product design [21]. In Poland, this theme was raised by Ewa Kuryłowicz in 1996 for probably the first time. She published a paper on making the environment accessible to people with disabilities [22]. Another researcher, Marek Wysocki, draws attention to the responsibility of local governments in developing legal regulations defining the nature of public spaces [23]. Design trends nowadays are often referred to as *Design for All* (DfA), a design approach in which the user benefits from unrestricted access to products, services, and the environment, regardless of their individual characteristics or changes throughout their life. "Design for All" is also the title of a publication by Jolanta Budny [24]. The publication contains a list of legal regulations, a list of perceptual determinants and requirements for users with various types of disabilities and some more general principles of creating an accessible environment. As part of the DfA idea, the development of improvements related to the living environment of older people becomes extremely important. Commissioned by MEiN (Ministry of Education and Science), Elżbieta Niezabitowska [25] working with the research team of the Silesian University of Technology carried out relevant work in this field delivering the research project entitled "Medical, psychological, sociological and economic aspects of aging of people in Poland". Chapter "Living conditions for seniors - main research findings" published in PolSenior [26] is one of the results of the aforementioned collaboration. This project aims to demonstrate the correlation between the living environment of old people and their daily and life activity. Qualitative research was carried out in the form of a modified POE method applied to existing housing conditions and the type of necessary modernization measures needed to improve the living environment in terms of accessibility. As a result, it was concluded that residential buildings are not sufficiently adapted to the needs of disabled seniors and do not take into account the real needs of residents [26]. A similar theme was further developed as part of another research project carried out by the Niezabitowska team as a part of Polish-German cooperation entitled "Yesterday today and tomorrow of Polish and German housing estates" (2011–2012). Although Niezabitowska's research topics concern older people predominantly, the conclusions drawn

from the studies are similar, if not the same, to those concerning people with disabilities. [27].

The subject of disability discussed so far in relation to older people seems to be covering the main theme quite extensively. However, the issues studied so far do not refer directly to specific types of housing and the possibility of physical adaptation of these buildings.

Anna Ostańska's monograph concerning the revitalization of industrial housing estates [28] is an important paper tackling the subject. In the publication, valid proposals for systematic adaptation of staircases in blocks in OWT technology for disabled are presented. OWT buildings were built in two variants: one as a five-storey building without lifts and the other as a high (7 to 12 storeys) building with a lift. Unfortunately, even the existing lifts are not suitable for the transportation of people with disabilities due to their small dimensions, because of the way the door opens (manually), not to mention the difference in heights between the sidewalk and the ground floor level. For the taller buildings, Ostańska proposes to solve the problem by inserting new accessible elevators into the shafts remaining from the existing elevators. Direct access to the lift from the sidewalk would then be possible from the areas that used to be chutes. In the five-storey buildings where there are no elevators, the writer proposes to install new accessible ones in place of the smallest living quarters. People living there would need to be relocated to the two-story block superstructure added to the initial building. A ramp located on the opposite side of the building, with intact original entrances remaining, would subsequently provide the entrance for the disabled [28]. Another solution that can be offered to maximize and adapt space is to insert an elevator in place of an existing staircase and to then build a new free-standing stair in front of the building.

There are virtually no publications on the types of existing buildings in terms of the scale of problems with access for disabled and costs that a future user would encounter had they needed to adapt a particular space for a disabled person's needs.

2. POSSIBILITIES AND ESTIMATED COST OF ADAPTATION OF EXISTING BUILDINGS

Assuming that a residential building has been modernized and in the new spirit of design it has been adapted as an environment suitable *for all*, one can then consider the capacity of the inhabitants to adapt it to more individual needs of their own. The secondary housing market offers a large range of pre-fab concrete slab flats from late 1960s to the 90s. In Bialystok in August (2017) there were about 2000 flats for sale, of which nearly 400 (20%) were the *prefab block flats.* The prices of these apartments ranged from 100 000 PLN (21.5 m^2) to 400 000 PLN (85 m^2). With respect to new developments, the difference in price is quite significant, especially with regard to the new, furnished apartments for sale on the secondary market. The table below shows the approximate price of flats per square meter based on different time periods and varied technologies used to construct these.

All new builds, which are advertised as fit for the disabled, require a large cash sum or a long-term loan. These costs, even in case of purchase of a small two-

Table 1.
Comparison of indicative prices per square meter [PLN] in buildings with specific technology and particular date of build (as of August 2017)

Area	Technology and time of build / prices					
	brick (until 1969)	pre-fab concrete slabs	brick (1970-1989)	new brick (after 1989)	apartments from 2011[1]	base built 2018[2]
< 20 m^2	5450 - 5550	-	-	-	-	-
20 - 25 m^2	4150 - 5850	5200-6800	5200 - 5950	-	-	-
25.1 - 30	3950 - 6850	4150-5550	4150 - 5900	5050 - 5750	5300-5950	5350-6500
30.1 – 40	3900 - 6450	3650-5300	4400 - 5800	4050 - 6550	5350-7750	4900-6100
40.1 - 50	3650 - 6750	3500-5200	3450 - 4700	4450 - 7750	4900-7750	3950-6000
50.1 - 60	3650 - 5600	3150-4950	3250 - 5550	3350 - 5950	5000-6450	3900-5890
60.1 - 70	3400 - 5300	2950-4800	3550 - 5150	3200 - 6350	5200-7400	3900-5400
> 70	3750 - 5000	2200-4550	4700 - 4850	2500 - 7850	4900-7100	3900-6300[3]

Collated by the author; based on relevant data from chosen estate agencies

[1] Not including the prices of furnished apartments where prices reach 12500 PLN per square metre

[2] Not including the prices of a recent development where a square meter in the smallest flat was at 8000 – 9000 PLN, and in flats of 150 m^2 – approximately 6600 PLN.

[3] Prices for 100 m^2 flats; bigger flats are at 2400–4000 PLN

or three-bedroom flats (40-50m^2), mean 40 000 to 100 000 PLN price rise in comparison with the price of an old build with the lack of good accessibility. It is worth then to consider what financial investments would be required to adjust an older flat to a convenient accessible model rather than jump directly into a purchase of an expensive new build.

2.1. Main problems and disadvantages of housing maladjusted for disabled people

Typically, all apartments, regardless of the time of their build, are subject to some sort of reorganization and adaptation to the needs of the occupiers. Disabled users, especially those with reduced mobility, have the most difficult task. It has been assumed that the opening door clearance of 90 cm is sufficient for a disabled user to move from a space to a space, so is 120 cm width in case of a corridor. In addition, a manoeuvring space equivalent to a circle with 150 cm diameter at the pivot points is required, although the disabled themselves indicate that these requirements depend on the type of wheelchair (in fact more room might be needed). As a result, the biggest problems faced by people with disabilities are: door thresholds, the width of the door openings, narrow corridors and inaccessible bathrooms. Additionally, the areas just in front of the doors (door clearance) become crucial points too, and often one has to stand "sideways" to open them. The required comfortable "manoeuvring area" depends on the direction in which the door opens: clearly more space is needed for the doors opening "in/towards" than "out".

In all the concrete slab blocks of flats the main problem is the width of the door openings. As far as the entrance doors are concerned – these are just at about the required 90 cm. In this case the problem may not be as visible, however, the doors to individual rooms within the flats are only 83 cm wide, proving beyond reach to wheelchair users. In such flats, the bathroom becomes completely inaccessible with 70 cm wide doors and clearly not enough space for the rotation of a wheelchair. Often, the decision to replace a bathtub with a shower is not only motivated by the comfort of use, but also an attempt to enlarge the space. The kitchen area is more adaptable, but there often remains the problem of storage space that needs to be within the reach of a disabled user. Similarly, there are issues with accessible storage solutions due to narrow corridors.

2.2. Concrete slab pre-fab buildings – adaptability

Presented below are some of the main features of older concrete slab systems developed in the 20th century alongside some sample plans and construction methods [29]. For comparison, M3 apartments of similar size were chosen, all between 38–48 m^2. These projects are presented alongside the proposed changes that should be implemented in selected apartments. The suggested alterations take into consideration the principle of designing spaces for people with disabilities in such a way that the interiors ensure maximum mobility with the use of the least amount of energy. In the drawings, "predicted manoeuvring" space is marked as 150 × 150 cm square.

Savings Concrete Slab Buildings **OW-1700** (1962) and derived from it the Savings Concrete Slab – Standard **OWT-67** (1967). The first one was created when in order to reduce costs the standard of dwellings was drastically lowered, implementing, for example, a joint plumbing core on individual floors. At that time, a system was created which lowered the cost of implementation, but at the same time allowed to design standard apartments of four types M2–M5, which still were fully equipped. In the OWT-67, a 540 × 480 rectangle became the primary surface module and the reduction of the depth of the track allowed for the creation of more functional systems. The new system offered the possibility of full housing offer from M1 to M7. The apartments were good for spatial allocation of furniture, the size of the kitchen varied, the size of the bathroom was increased (145 × 160 cm) and a separate toilet (80 × 120 cm) was added. Bathroom partitions were made of 5 m thick reinforced concrete slabs, walls made of plaster boards Promonta (kitchen partition walls) or cardboard-plaster (most rooms).

Possible adjustment of space in OWT-67. The bathroom in this system is so small that the entire area of it is the required manoeuvring area for the disabled wheelchair user. In the illustrated example, it is not possible to enlarge the bathroom due to access to the room (Fig. 1A). However, it can be adjusted by removing the wall between the WC and the bathroom and widening the entrance (towards the room). The new bathroom should have a shower with a low shower tray, or preferably no shower tray (Fig. 1B).

Warsaw Universal Form – Standard buildings **WUF-T** (1967). This layout was designed to create solutions for improved flats with better utility values within the spirit of industrialization. It allowed for flats of different sizes from M2 to M7 (without M1) all with separate

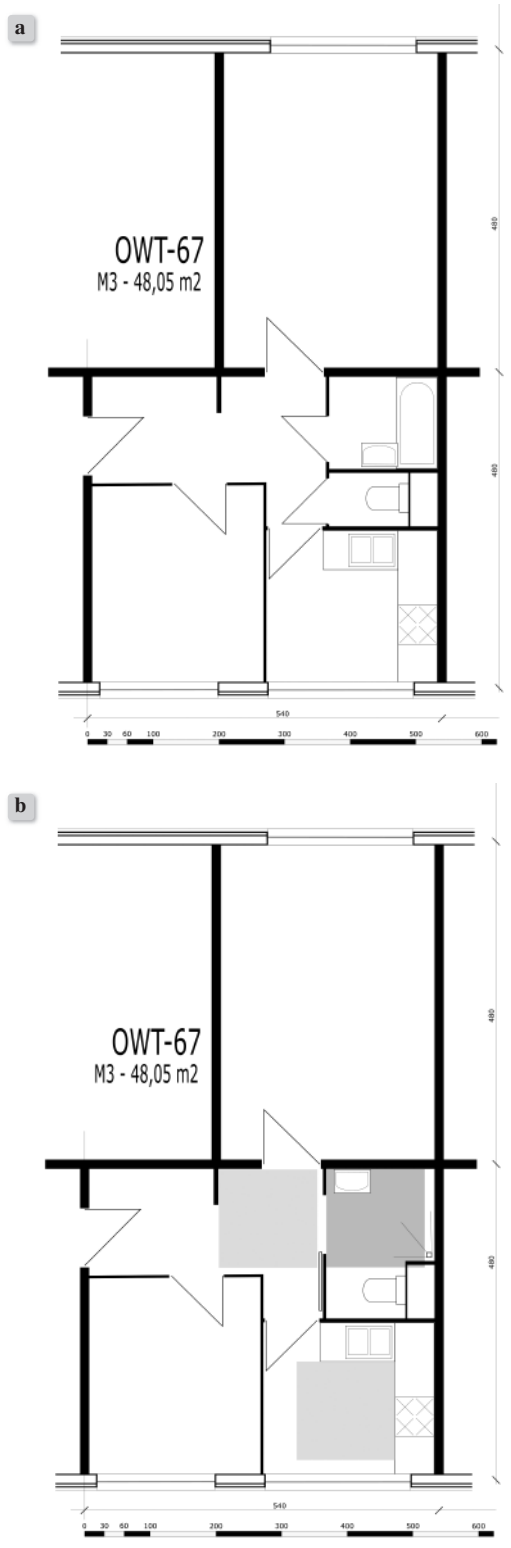

Figure 1.
A. Apartment type M3 in OWT-67 technology. Source: author based on [29]
B. Adjustment of the apartment to the needs of the disabled, proposed changes. Source: author

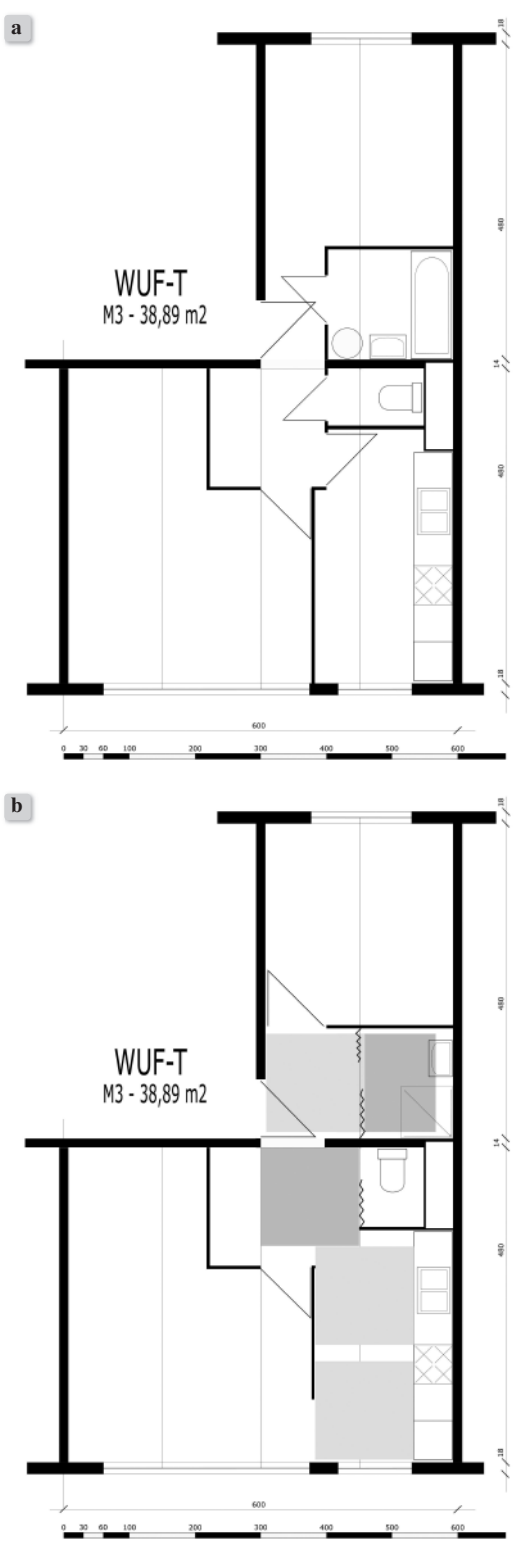

Figure 2.
A. Apartment type M3 in WUF-T technology. Source: author based on [29]
B. Adjustment of the apartment to the needs of the disabled, proposed changes. Source: author

WCs. In all cases, simultaneous two-sided lighting (i.e. east – west or north – south) was utilized and kitchens were lit with daylight. The latter were always single – row, narrow and elongated. In apartments M3 to M7 the kitchen was directly accessible from the hall. In this layout, a mixed-use kitchen-bathroom system was used: with one plumbing core. Built-in cabinets were placed in the hallways. The overall spatial layout was based on a modular grid of dimensions N × 150 × 480 cm. The walls were 14 cm thick; partition walls were made of Promonta plaster boards (7 cm thick) and mesh reinforced concrete walls (5 cm thick).

Possible adjustment of space WUF-T. Entrance doors do not need to be adjusted as they are 90 cm wide, however, one would need to remove the thresholds. Smaller homes M2–M3 have a narrow entrance corridor, only about 1 meter wide, larger apartments have adequate "manoeuvring" space. There is no need to install sliding doors in rooms, a disabled person should be able to open them. A substantial problem, however, is the adaptation of the bathroom and the toilet to the needs of a disabled person, especially since it is divided by a structural wall (Fig 2A). The only reasonable solution is to provide "manoeuvring" space in front of the bathroom and toilet and make these available through folding doors which would open the whole space (Fig. 2B). In such a solution, the washing machine needs to be moved to the kitchen.

Wroclaw Concrete Slab Buildings **WWP** (1968). In this system, the layout of the apartments was arranged in three surface modules: 540 × 270, 480 × 270, 240 × 540 cm as well as in the so-called complementary module of 300 × 270 cm. As part of the project, sets of independent units of apartments M1 to M6 were grouped into segments. Functional spatial layout was created around the "core" of the kitchen with a sanitary cabin (bathroom). Bathrooms in M3 and larger apartments had a separate narrow WC (80 cm wide). In the hallways, built-in cabinets limited the space to 120 cm wide. Sanitary cabins (203 × 153 cm) were completely prefabricated with a complete set of connections and wiring. The entire cabin was set on the slabs. Interior walls were 14 cm thick and the partition walls were mainly made of slag and gypsum boards (7 cm), reinforced with steel frames and embedded cables. The 4–5 cm thick walls of the sanitary cabins were made of reinforced concrete.

Possible adjustment of space WWP. In this spatial layout, the bathroom is quite large, which facilitates decent design solutions in terms of surface area (Fig. 3A). One of the solutions could be to move the toilet bowl to the bathroom space and to install a shower tray in the former WC accessible through the opening cut between the two rooms (Figure 3B). It would also be necessary to widen the door to the bathroom, that is, to cut out the steel frame and cut the hole in the concrete to minimum 90 cm. The positioning of the new opening depends on the proximity of the door to the next room. Please note that there are cables embedded in the walls. In the example shown, one would also need to widen the entrance zone by removing the built-in cabinets.

Szczecin System (1968). In this layout, one ceiling span (of 480 cm) was used. The apartments were arranged using 240 × 480 cm modules. This grid gave the possibility of creating PKW dwellings (20 m^2) which were equivalent to M1 to 5PK (74 m^2) and later M7. 2PK type of flats have been adopted as the basis for all design solutions. PWK and PK apartments have a bathroom that integrates a WC. Various kitchens were developed for individual types of apartments PWK, PK and 2PK-5PK. Main plumbing was designed using a 240 × 480 cm module. Sanitary cabins were made of prefabricated units, using reinforced concrete walls (4 cm thick), equipped with their own ceiling and floor, as well as the installation of risers and connections. In larger apartments with a separate WC, the prefabricated WC unit was fitted directly into the sanitary booth. Modular arrangements and dimensions of specific living areas allowed for the use of built-in furniture in the kitchen and wardrobes in the halls.

Possible adjustment of space in Szczecin System. The system has a ready-made concrete sanitary capsule inserted into the interior. The modification of this space is, therefore, very difficult. It is possible to propose to demolish a wall which the WC is sharing with the bathroom cubicle and suggest the use of the toilet unit from the bathroom "manoeuver" space. In place of the bath one could insert a shower and a washbasin opposite the entrance door (Fig. 4B). It would also be possible to use the adjacent corridor space to install a washing machine accessible from the bathroom. In order to ensure enough room in the corridor area in front of the kitchen and bathroom, it would be necessary to remove two parts of the wall adjacent to the kitchen and to widen the entrance to the bathroom from 70 cm to a minimum of 80 cm, although it could cause additional problems with the wall-embedded electric installation.

Second generation open system **W-70** (1967–1970). The system was based on a 60 × 60 cm modular grid that used four types of span: 600 (basic), 480, 360 and 240 cm. The architectural flexibility of the system

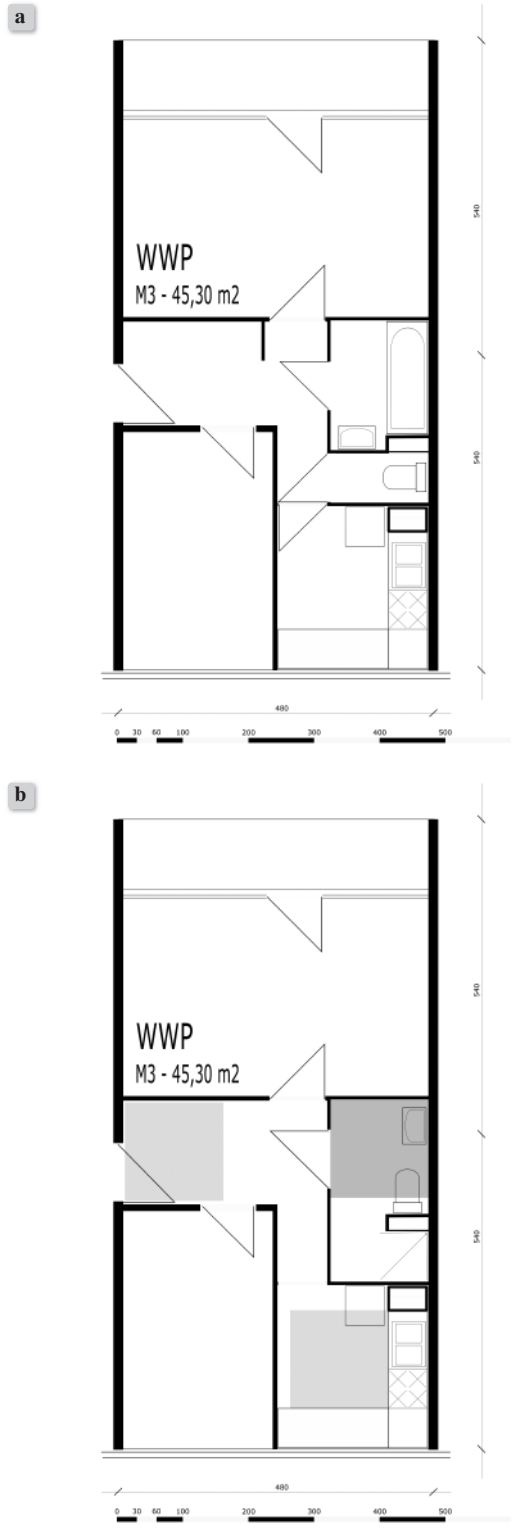

Figure 3.
A. Apartment type M3 in WWP technology. Source: author based on [29]
B. Adjustment of the apartment to the needs of the disabled, proposed changes. Source: author

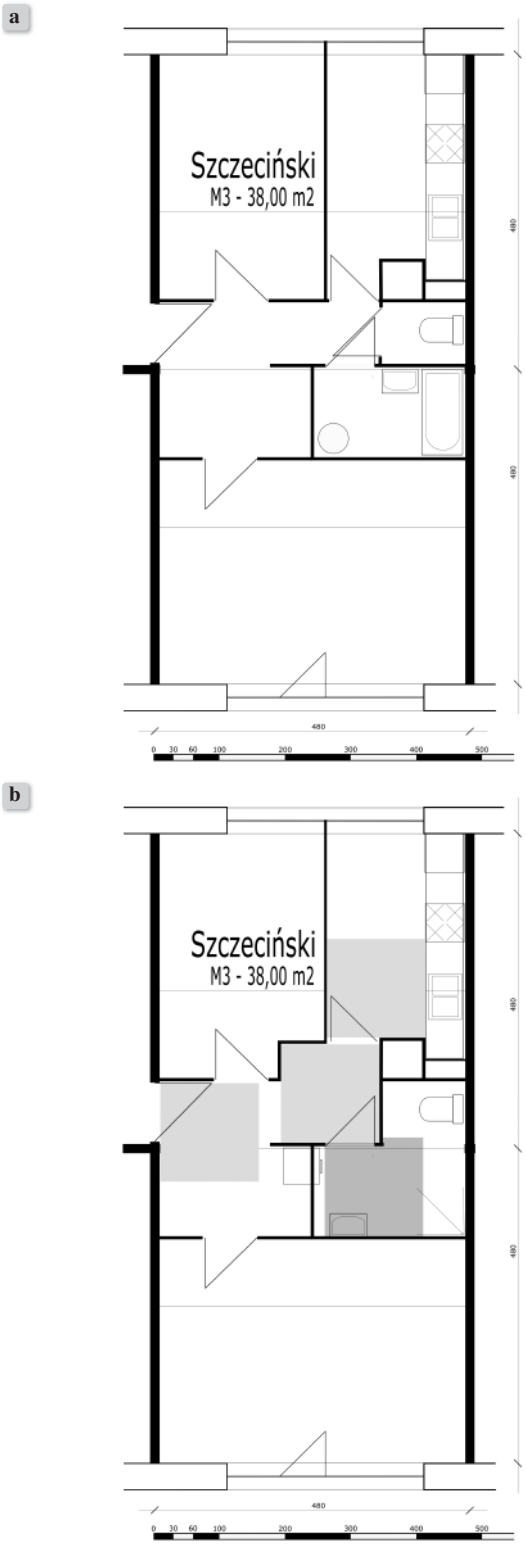

Figure 4.
A. Apartment type M3 in Szczecin System. Source: author based on [29]
B. Adjustment of the apartment to the needs of the disabled, proposed changes. Source: author

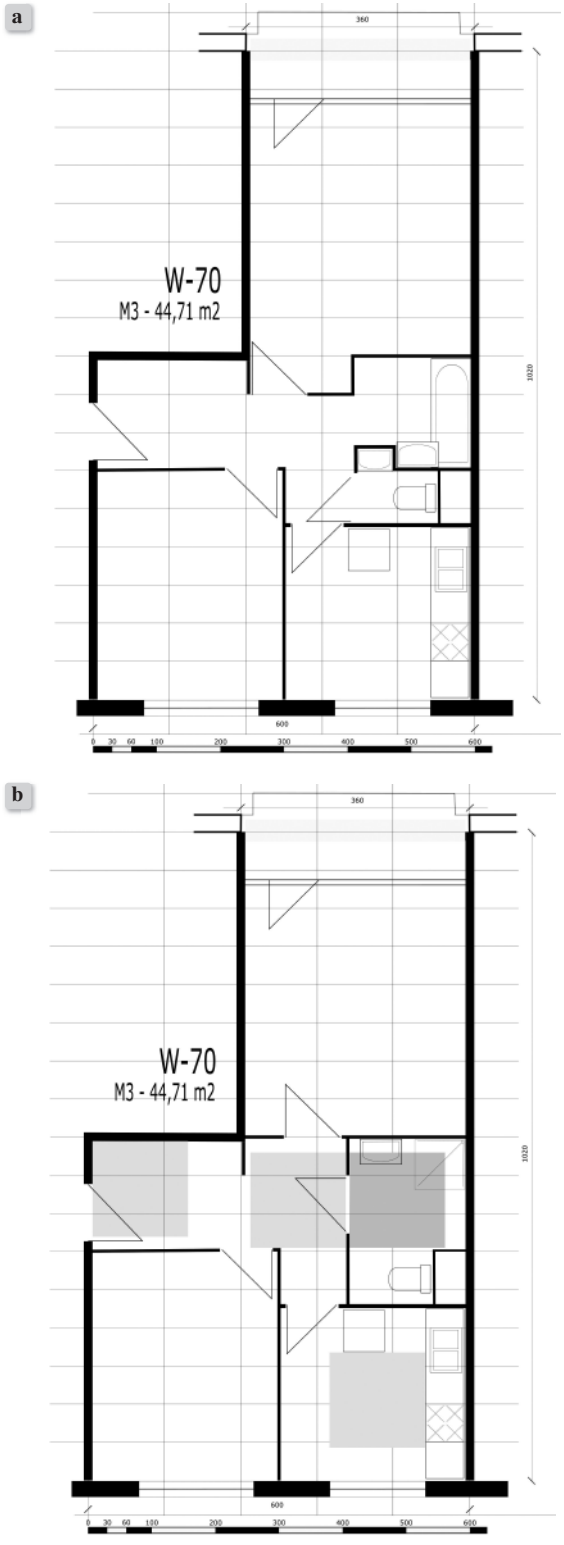

Figure 5.
A. Apartment type M3 in W-70 technology. Source: author based on [29]
B. Adjustment of the apartment to the needs of the disabled, proposed changes. Source: author

allowed to shape dwellings in different sizes and in various layouts. Three main types of sanitary cabins were used: KSM 190 × 210 cm, KSS 190 × 240 cm and KSD 190 × 270 cm. Bathrooms with dimensions of 180 × 170 cm gave significantly greater design possibilities, too. The layout of the apartment depends on the number of water and sewer hubs, which meant a kitchen and toilet would need to be adjacent in case when only one "hub" was installed. Such a solution was restricting the zoning of the apartment. There was an option of creating a kitchen that is not connected in any way with the bathroom and equipped with its own ventilation and plumbing system. The kitchen, all in all, was relatively easy to lay out. The sanitary cabins, consisting of a bathroom, a WC, and all the fittings, were integrated into one reinforced concrete element (floor, walls and ceiling) produced in the factory offsite. Work on the site was limited to placing the "capsule" on the floor. Construction walls were made of 15 cm thick slabs whilst partition walls were 5 cm thick.

Possible adjustment of space in W-70. The spatial layout of this system makes it look well thought out (Fig. 5A). There is no need for major interventions. In the example presented, it would be necessary to remove the built-in wardrobes from the corridor and to connect the bathroom and WC spaces in order to easily increase accessibility for a disabled user. The suggested removal of the joint partition wall would allow for the use of a toilet bowl from the bathroom "manoeuvring" space (Fig. 5B). It would also be necessary to introduce a new door opening, as the currently used ones are only 70 cm wide.

Monolithic Building System **SBM-75** (1969–1975). The system was based on a modular grid of 60 × 60 cm. In residential interiors, the ceiling span could be as much as 780 cm. The system provided the possibility of constructing buildings in any rectangular layout and could be combined with the W-70. The sanitary unit (bathroom) was 180 × 180 cm, which gave an option of using a 170 cm long bathtub. Depending on the type of apartment the WC was either built into the bathroom space or separated (from 3PK, or M4). Kitchens did not have to be attached to the bathrooms.

Possible adjustment of space in SBM-75. In the illustrated example, the bathroom space does not allow for the disabled person to be able to use it freely, even if the bathtub was to be exchanged for a shower there would not be enough "manoeuvring" space (Fig. 6A). In this case it would be necessary to enlarge the bathroom at the expense of the corridor

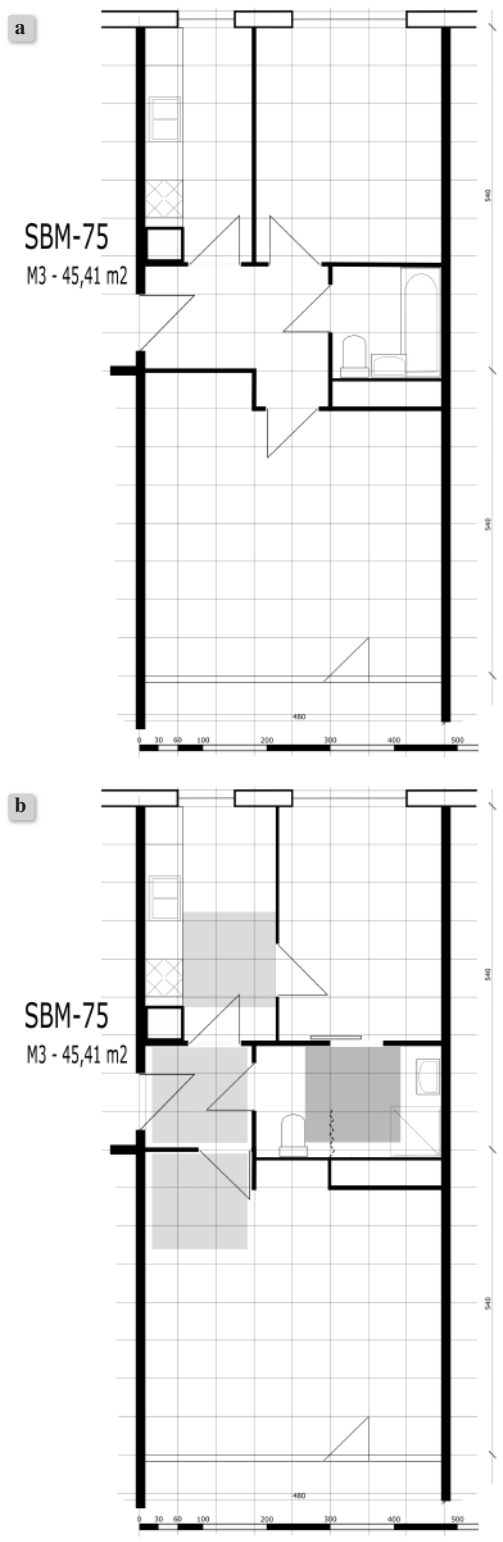

Figure 6.
A. Apartment type M3 in SBM-75 technology. Source: author based on [29]
B. Adjustment of the apartment to the needs of the disabled, proposed changes. Source: author

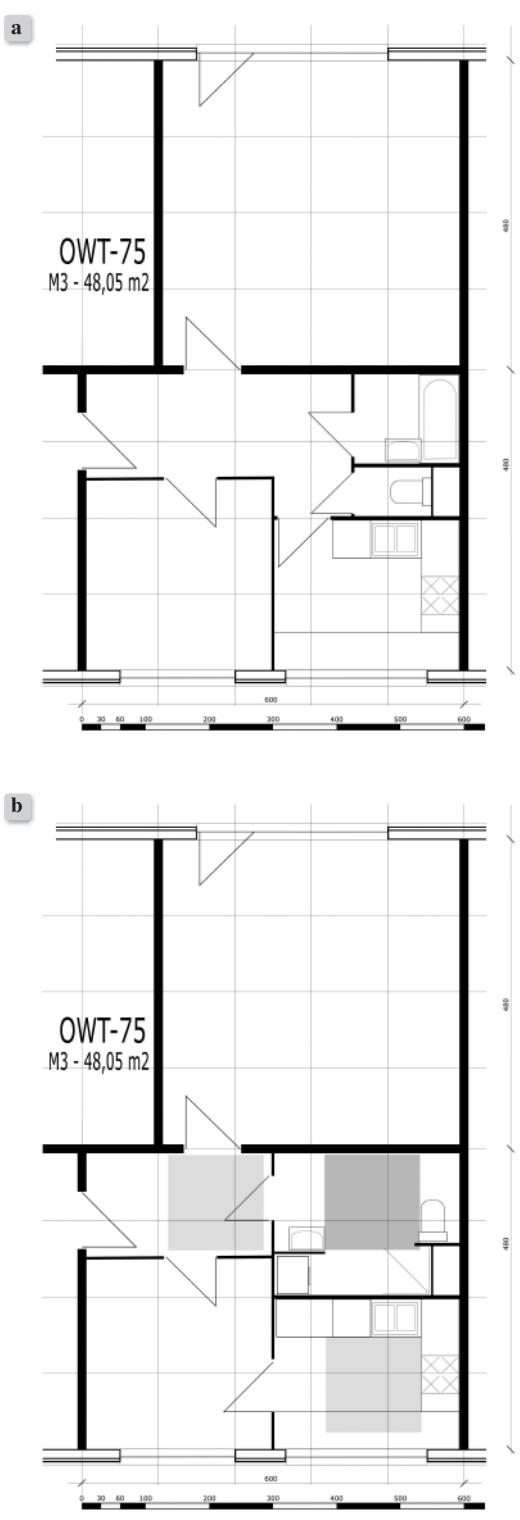

Figure 7.
A. Apartment type M3 in OWT-75 technology. Source: author based on [29]
B. Adjustment of the apartment to the needs of the disabled, proposed changes. Source: author

and to break through the wall from the kitchen into the room. Such a solution would make the bathroom accessible both from the corridor and from the disabled person's room, the introduction of a sliding wall near the toilet seat would provide a way of separating the space if needed (Fig. 6B).

Savings Concrete Slab - Standard **OWT-75** (1975). In this system, a new area module of 120 × 480 cm was used, which introduced the use of ceilings with a span of up to 600 cm. The new housing law (1974) brought in a utility update, which allowed the existing production base to be used to create larger housing. In this system, a whole set of apartments from M1 to M7 (26.5 m^2–95.4 m^2) were built. Kitchens were available in two options: connected to a sanitary unit or independent of it. Reinforced concrete and gypsum plaster boards were used for partition walls. The size of the bathroom could vary from 120 × 240 cm (with a WC included) to 180 × 240 cm or 240 × 240 cm (with a separate WC).

Possible adjustment of space in OWT-75. The following example shows a solution similar to OWT-67, but at a larger size (Fig. 7A). As there is no door positioned directly near the bathroom, it would be possible to propose a larger bathroom space using the area of corridor connecting the entrance hall to the kitchen. This solution would allow for the toilet seat to be moved to a larger part of the bathroom and the subsequent use of the space after the toilet seat for a low-tray shower. The additional space remaining in the corridor could be used to locate a washing machine (Fig. 7B).

2.3. Estimated cost of proposed adjustments

The table below lists some indicative costs of the proposed renovations. It is assumed that the changes made are combined with the costs of complete renovation of the sanitary facilities (bathroom and WC). The estimates are based on construction calculators [30] and relevant information from a specialist company (specializing in drilling, forging and cutting of concrete and reinforced concrete [31]. In addition, the average costs of ceramic tiles and fittings, the same in all cases, were taken into account.

Table 2.
Indicative comparison of the costs of adapting an M3 flat to the needs of the disabled (adjustments shown in Figures B); built in different technologies

Purchasing and construction	Cost in a particular building system						
	OWT-67	WUF-T	WWP	Szczeciński	W-70	SBM-75	OWT-75
modernization works without bathroom equipment (PLN)							
demolition of partition walls,	1850	5900	1300	2100	2500	3750	3450
widening of the opening for the bathroom door	250	-	250	250	250	250	250
fixing of the wall around the new door opening	400	-	400	400	400	400	-
erecting a partition wall (with the material - plasterboard)	-	260	-	-	-	500	700
floor replacement (terracotta – 41.50 PLN / m^2)	900	950	950	1050	1050	1150	1250
replacement of wall tiles (glaze – 41,50 PLN / m2)	2700	2900	2950	2950	2800	2950	3600
purchase and door installation	600	1300	600	600	600	600	600
replacement/installation of water and sewage plumbing systems	1100	1100	1700	1100	1100	1700	1700
installation of plumbing fixtures	1000	1000	1000	1000	1000	1000	1000
repairs to/replacement of electrical installation	650	900	750	650	650	1000	1100
total:	**9 450**	**14 310**	**9 450**	**10 100**	**10 350**	**13 300**	**13 650**
purchase of bathroom equipment and assembly (PLN)							
purchase of Washbasin/s, Toilet Bowl, Shower Tray	1300						
Shower	800						
Bidet Toilet Seat	550						
Taps	1000						
total cost of modernization with bathroom equipment	**13 100**	**17 960**	**13 100**	**13 750**	**14 000**	**16 950**	**17 300**
total cost with the use of no tray shower*	14 900	19 760	14 900	15 550	15 800	18 750	19 100
the possibility of inserting a bath for the disabled **	NO	YES 160x75	NO	NO	YES 170x75	YES 170x75	NO

* Using a no-tray shower add: shower +900, cabin +700, liner 200.
** The examples given are illustrated (drawings XB). In the case of purchasing of a bathtub for the disabled, the price of the bath needs be added at 170 × 75 – 4200 PLN, 160 × 75 – 3900 PLN, 135 × 75 – 5400 PLN, (data from Polimat) and the shower and shower tray installation at approx. 1400 PLN should be detracted from the repair cost

2.4 Concrete slab pre-fab versus contemporary construction: the comparison of costs and possible refund options.

Every renovation is very absorbing, requires a new design, suitable contractors and is extremely costly. The biggest expenses are to do with the main construction works, plumbing and electrical installations – all the issues that people with disabilities who are improving their flats are most likely to encounter. It is of utmost importance that under the Ordinance of the Minister of Labour and Social Policy of 25 June 2002 [32] disabled persons who are owners of the property or who have the consent of the owner of the premises where they live permanently may apply for co-financing of adjustments and improvements in their living premises from the PFRON funds ([32] §2.(4)). Applications for such payments are handled by the District Family Support Centres (PCPR) or the Municipal Family Relief Centres (MOPRs). The amount of funding claimed can reach up to 95% of the planned expenditure, but may not exceed fifteen times the average salary ([32] §13. 4). In 2013, as a result of the Resolution of the PFRON Board of Directors, an official "Catalogue of equipment, works and other activities subject to financial support from the PFRON funds for the elimination of architectural barriers" was created [33]. Most importantly, any projects and works that were to be implemented in buildings built after January 1, 1995 cannot qualify for the funding. This proves that all newly built apartments are, or at least should be, on paper, adapted for use by persons with disabilities.

Even a very quick analysis of the contemporary housing indicates that the availability of housing for the disabled is not a priority for developers. Due to the current housing crisis, quantitative housing needs are met at the expense of quality [34]. Nowadays, when the apartments are purchased within the minimum needs (basic functionality) and the maximum financial capacity (extremely costly flats) there is a lack of incentive for developers and designers of multi-family housing to deliver well designed spaces. Undoubtedly, it is equally noticeable that there is no adequate buyer awareness either. It is important to note that flats are usually bought by young people who, faced with a thirty-year loan, tend to analyse the number of square feet of space rather than space itself. They do not think in terms of functionality or the lack of it, so it is crucial that this role is sustained and modelled by the designers. In Poland people don't tend to live in rented apartments, although it often seems necessary, which also can be a problem. This is a result of economic conditions rather than a lifestyle choice. As soon as the borrowers get adequate mortgage, they decide to buy their own apartment rather than rent. It is difficult to talk about the high mobility of Polish society or the possibility of a quick change of housing arrangements depending on needs because of the aforementioned factors.

Newly built dwellings are an improvement in the quality of functional solutions, but in recent years there still have been a number of shortcomings that may affect the quality of life of their users. The first problems can be spotted in the corridor areas. Due to the regulations stating that the apartments are to be accessible from each floor, almost all the blocks currently being built, are equipped with elevators, which significantly increases the cost of construction.

To balance this extra cost developers tend to propose over-simplified layouts. This creates many unilateral dwellings in which the whole apartment is laid out along one long access corridor. This causes the communication issues and the difficulty in moving easily in such an interior. The most spatially - sought apartments are the 50 m^2 ones, consisting of 2 bedrooms, a living room and a kitchen, or more often just a kitchenette. Bathrooms in these premises are usually combined with a WC and have an area of between 3 to 5 m^2. Some of them have a very generous space, where one can easily find enough room to manoeuvre a wheelchair freely.

Unfortunately, often the way the units and fixtures are laid out does not indicate that the functional layout had been designed with a disabled person in mind. The cost of adapting the bathroom in a new building is comparable to its functional modernization, because of the cost of new apartments most buyers choose to buy these at the "developer stage", but where they still need to do "the final touches". Therefore, one can assume that bathrooms in new flats will not normally require complete renovation, but only surface "cosmetic" changes. Nevertheless, it may be necessary to reinstall the plumbing system so that the fixtures can be moved around or swapped to accommodate for needs of a disabled person (e.g. installing a low shower tray instead of a bathtub). Creating extra space usually happens at the expense of a washing machine which is subsequently transferred to the kitchen. The cost of "improving" a bathroom of 4 square meters will amount to about 5300 PLN (floor and tiling: 550 PLN, walls: 1600 PLN, changes to plumbing: 800 PLN, equipment and assembly: 2350 PLN). Neither of these steps, even the less substantial adjustments, will be eligible for refunds in case of new builds.

Table 3.
Flat Accessibility Chart[1]

Flat Accessibility Chart		
Door lock below 120 cm	YES	NO
Threshold (if any) lower than 2 cm	YES	NO
150x150 cm free manoeuvring space when doors are open	YES	NO
Does every room have an opening (door) of 80-90 cm wide?	YES	NO
Is it possible to insert sliding doors into the rooms?	YES	NO
Is there enough room to rotate a wheelchair by 180º?	YES	NO
Is the kitchen open-plan or has an entrance opening of minimum 90 cm?	YES	NO
Electrical and light switches are located at 90-120 cm.	YES	NO
Are the plugs located at a height of 20-30 cm from the floor?	YES	NO
Does the bathroom have a manoeuvrable space equivalent to Ø 150 cm?	YES	NO
Will the bathroom have such space after replacing the bathtub with a shower?	YES	NO
Is there enough room to position the wheelchair next to the toilet seat?	YES	NO
Is there enough room for mounting brackets on both sides of the toilet seat (including at least one that is movable)?	YES	NO
In the case of a separate small WC toilet is the toilet seat accessible from the main bathroom?	YES	NO

[1] the more YES answers, the more accessible the flat is

3. SUMMARY

According to the brief analysis presented above, modern developments are more accessible and better suited to the needs of the disabled in comparison with the flats built before 1995. These do provide better ease of access for disabled people to all premises in the buildings. Only sporadically, however, the same principle is applied within the interiors of the apartments, which inevitably undermines the effort and the investments in the initial and "external" improvements. It is therefore important to promote solutions that ensure that all occupants (and their guests) could use all the spaces of the building (both the communal and access areas as well as private spaces within the flats) without undue effort. It should be noted that this must not only mean adding equipment for the disabled. It should come from the design and well-thought solutions proposed at the design stage, otherwise this kind of post-facto intervention might lead to further segregation rather than the feeling of inclusivity. In principle, accessibility should be imperceptible and "a natural phenomenon". An interior should be completely accessible to anyone and everyone irrespective of their degree of efficiency, age, health or disability. Designers and developers should follow the principles of universal design, "pre-emptive design", as advocated by representatives of the Wroclaw University of Technology [34]. The current level of housing quality in the face of the lack of funding for adaptation measures (in terms of eliminating barriers) puts the average user in a tricky situation. Even if not every apartment is designed directly for a disabled user, it should be planned in such a way that it could be easily adapted to their needs. Perhaps, it would be good to require from the designers two options of design layout: one that is the "standard" one and another fully adapted to the needs of a disabled person. This increased amount of work for the designers will undoubtedly affect the way the individual rooms are thought out at initial stages. Current legislation does not propose any standards that would regulate these issues; it would be a good idea to introduce some housing accessibility standards for flats (interiors), as it already is the case in public spaces [35]. At the same time it would be possible to propose and collate a kind of a Charter (Standard) of the housing accessibility, similar to Checklist: in order to check whether the building and its interior spaces are accessible to all [36], which would allow for the classification of the apartments still at the design phase and at the project approval stage (including administration purposes).

In conclusion, the need to include the concrete slab pre-fab buildings into the accessibility debate should be emphasized. Adapted externally and internally for people with disabilities these would become much more competitive. The improvements would also contribute to the overall quality of life of all the residents, as many of them are still living in the relatively excluded world of the elderly in the same flats they purchased when they were young. Perhaps, some funds could be obtained from the EU? It would be good to use the potential of old blocks of flats, which, in most cases, are well located, have convenient infrastructure and are quite spacious, especially so because their repetitive layouts can easily (albeit a bit costly) be adapted to modern standards and personal needs of all users.

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